

1 1AP20 Rec'd PCT/PTO 20 JUN 2006

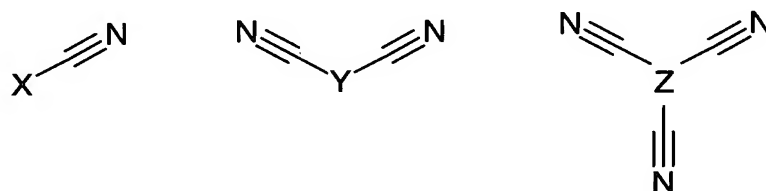
As enclosed to IPER

# Claims

- 5 1. A process for hydrogenating nitrile functions present in organic compounds over at least one heterogeneous catalyst, wherein the hydrogenation is carried out in the presence of an ionic liquid and the anion of the ionic liquid is selected from the group consisting of halides  $F^-$ ,  $Cl^-$ ,  $Br^-$ ,  $I^-$ , acetate  $CH_3COO^-$ , trifluoroacetate  $CF_3COO^-$ , triflate  $CF_3SO_3^-$ , sulfate  $SO_4^{2-}$ , hydrogensulfate  $HSO_4^-$ , methylsulfate  $CH_3OSO_3^-$ , ethylsulfate  $C_2H_5OSO_3^-$ , sulfite  $SO_3^{2-}$ , hydrogensulfite  $HSO_3^-$ , chloroaluminates  $AlCl_4^-$ ,  $Al_2Cl_7^-$ ,  $Al_3Cl_{10}^-$ , tetrabromoaluminate  $AlBr_4^-$ , nitrite  $NO_2^-$ , nitrate  $NO_3^-$ , dichlorocuprate  $CuCl_2^-$ , phosphates, phosphate  $PO_4^{3-}$ , hydrogenphosphate  $HPO_4^{2-}$ , dihydrogenphosphate  $H_2PO_4^-$ , carbonate  $CO_3^{2-}$ , hydrogencarbonate  $HCO_3^-$ , sulfonate  $-SO_3^-$ , tosylate  $p-CH_3C_6H_4SO_3^-$  and bis(trifluoromethylsulfonyl)imide  $(CF_3SO_2)_2N$  and the ionic liquid  
10 contains phosphonium ions and/or at least one five- or six-membered heterocycle which contains at least one phosphorus or nitrogen atom and, if appropriate, a sulfur and/or oxygen atom.
- 20 2. A process according to claim 1, wherein a nonpolar ionic liquid is used in the case of a heterogeneous catalyst having a polar surface and a polar ionic liquid is used in the case of a heterogeneous catalyst having a nonpolar surface and/or ionic liquid and catalyst are chosen so that starting material or product reside in a different phase and/or irreversible occupation of the catalyst is prevented by the ionic liquid.
- 25 3. A process according to claim 1 or 2, wherein the ionic liquid has a melting point below  $200^\circ C$ .
- 30 4. A process according to any of claims 1 to 3 carried out in the absence of ammonia.
- 35 5. A process according to any of claims 1 to 4, wherein, in the case of a suspension process, the catalyst and/or the ionic liquid are recirculated separately or together to the process or, in the case of a fixed-bed process, the ionic liquid is recirculated to the process.
6. A process according to any of claims 1 to 5, wherein a heterogeneous catalyst based on nickel, cobalt, copper, iron, ruthenium, rhodium, iridium, palladium and/or platinum is used, if appropriate as a skeletal catalyst.

7. A process according to any of claims 1 to 6, wherein the hydrogenation is carried out at a temperature of from 20 to 250°C and/or a pressure of from 1 to 300 bar.

8. A process according to any of claims 1 to 7, wherein the nitriles to be hydrogenated have at least one of the following structural units:



where X in the structural units is a linear, branched or cyclic group selected from the group consisting of alkyl, cycloalkyl, alkenyl, alkynyl, aryl, hydroxyalkyl, alkoxyalkyl, aminoalkyl and C<sub>1-4</sub>-aryl and y and z are selected from the group consisting of alkyl, cycloalkyl, alkenyl, alkynyl, aryl, alkoxyalkyl and aminoalkyl.

9. The use of ionic liquids in hydrogenations of nitrile functions present in organic compounds over at least one heterogeneous catalyst, wherein the anions of the ionic liquid are selected from the group consisting of halides F<sup>-</sup>, Cl<sup>-</sup>, Br<sup>-</sup>, I<sup>-</sup>, acetate CH<sub>3</sub>COO<sup>-</sup>, trifluoroacetate CF<sub>3</sub>COO<sup>-</sup>, triflate CF<sub>3</sub>SO<sub>3</sub><sup>-</sup>, sulfate SO<sub>4</sub><sup>2-</sup>, hydrogensulfate HSO<sub>4</sub><sup>-</sup>, methylsulfate CH<sub>3</sub>OSO<sub>3</sub><sup>-</sup>, ethylsulfate C<sub>2</sub>H<sub>5</sub>OSO<sub>3</sub><sup>-</sup>, sulfite SO<sub>3</sub><sup>2-</sup>, hydrogensulfite HSO<sub>3</sub><sup>-</sup>, chloroaluminates AlCl<sub>4</sub><sup>-</sup>, Al<sub>2</sub>Cl<sub>7</sub><sup>-</sup>, Al<sub>3</sub>Cl<sub>10</sub><sup>-</sup>, tetrabromoaluminate AlBr<sub>4</sub><sup>-</sup>, nitrite NO<sub>2</sub><sup>-</sup>, nitrate NO<sub>3</sub><sup>-</sup>, dichlorocuprate CuCl<sub>2</sub><sup>-</sup>, phosphates, phosphate PO<sub>4</sub><sup>3-</sup>, hydrogenphosphate HPO<sub>4</sub><sup>2-</sup>, dihydrogenphosphate H<sub>2</sub>PO<sub>4</sub><sup>-</sup>, carbonate CO<sub>3</sub><sup>2-</sup>, hydrogencarbonate HCO<sub>3</sub><sup>-</sup>, sulfonate -SO<sub>3</sub><sup>-</sup>, tosylate p-CH<sub>3</sub>C<sub>6</sub>H<sub>4</sub>SO<sub>3</sub><sup>-</sup> and bis(trifluoromethylsulfonyl)imide (CF<sub>3</sub>SO<sub>2</sub>)<sub>2</sub>N<sup>-</sup> and the ionic liquid contains phosphonium ions and/or at least one five- or six-membered heterocycle which contains at least one phosphorus or nitrogen atom and, if appropriate, a sulfur and/or oxygen atom.